LAWRENCE LIVERMORE
REPORT

A weekly collection of scientific and technological achievements from Lawrence Livermore National Laboratory: March 22-March 29, 2010

NIF win's *Diablo Magazine* Eco Award

The National Ignition Facility target chamber.

Lawrence Livermore's National Ignition Facility is one of four of the East Bay's national labs that recently earned a *Diablo Magazine* Eco Award

Diablo claims LLNL, Lawrence Berkeley, Sandia and the Joint BioEnergy Institute, a Department of Energy-funded lab in which Livermore plays a role, win the award for "tackling the most important environmental issues of our time."

"The East Bay's national laboratories are on the forefront of the quest for alternative renewable energy sources."

At Livermore, unlimited clean energy is possible using the largest and most powerful laser on Earth at the National Ignition Facility. Experiments to achieve fusion -- the same energy that fuels the sun -- are scheduled for later this year.

For more, go to http://www.diablomag.com/Diablo-Magazine/April-2010/2010-Diablo-Eco-Awards/index.php?cparticle=1&siarticle=0#artanc

Better sleuthing through chemistry

When it comes to finding out whodunit in chemical warfare cases, one needs to look no further than to scientists at Lawrence Livermore.

Researchers have developed a technique to ascertain the chemical fingerprint of compounds such as mustard gas, rat poison and nerve agents such as VX. Figuring out the details of how these compounds were created in the first place could provide vital clues to law enforcement agencies aiming to catch chemical warfare criminals and help guide first responders as they gather evidence.

Chemical forensics typically focus on identifying the compound in question, but chemist Audrey Martin and her LLNL colleagues took these analyses a step further. "If we already know this was a chemical attack using mustard gas, now we want to know who made it," said Martin, who presented the research at a recent meeting of the American Chemical Society. "We're looking at the next step -- where did this come from?"

To read more, go to
http://www.sciencenews.org/view/generic/id/57561/title/Better_sleuthing_through_chemisty

The road to better fuel efficiency

The world's largest wind tunnel at the NASA Ames Research Center was the setting this month for full-scale testing of new devices to reduce the aerodynamic drag of semi-trucks. The

Laboratory has partnered with trucking company Navistar, NASA Ames, the U.S. Air Force and industry to develop and test these devices that could increase fuel efficiency by 12 percent.

Lab Director George Miller gave this equivalent: "To some of you, 12 percent may not sound like very much. On the other hand, 12 percent is 3.4 billion gallons of diesel fuel -- equivalent to about $10 billion saved every year. And it's also the equivalent of 36 million tons of CO2 going into the world's atmosphere."

Some of the Lab's largest computer platforms and most advanced computational fluid dynamics codes were used to identify critical drag producing regions around semi-trucks.

To see more, to go http://www.ucop.edu/sciencetoday/article/22909

The up side of fusion energy

Fusion power is so attractive because if it's done right, it could be so abundant. The aim is to bring the same principle that fuels the sun down to Earth.

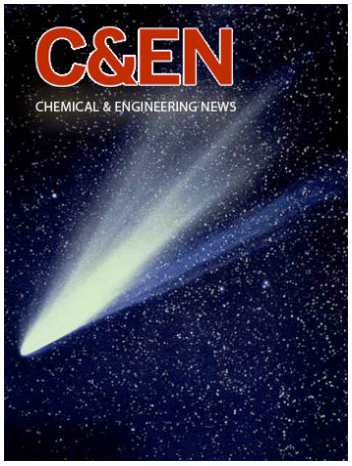
The Lab's National Ignition Facility will attempt to do that later this year when scientists crush atomic nuclei together to produce bigger nuclei (turning hydrogen to helium, for example), and in the process convert a tiny bit of mass into pure energy (in accordance with Einstein's $E=mc^2$ equation).

So how do you create a controlled reaction with enough temperature and pressure to get those nuclei fused together?

One way is to blast the fuel with precisely arranged laser beams. That's what's on the horizon for the NIF, in hopes of creating the first-ever controlled reaction that puts out more energy than it takes in.

To read more, go to http://cosmiclog.msnbc.msn.com/archive/2010/03/23/2237165.aspx

Comets may have brought the building blocks of life to Earth



The high temperatures and pressures generated by a comet hitting a planet could yield prebiotic molecules out of extraterrestrial ices carried by the comet, according to Laboratory scientist Nir Goldman.

Goldman and colleagues modeled the shock compression and subsequent expansion of a typical comet mixture of water, methanol, ammonia, carbon monoxide, and carbon dioxide molecules to see what could happen if a comet were to smack into a planet's surface. For shock compressions lasting about 20 picoseconds at temperatures up to 6,740 degrees Fahrenheit and about 60,000 atmospheres of pressure, the researchers observed the formation of chains of carbon and nitrogen atoms, some parts of which were similar to chains of amino acids.

The results show that a comet colliding with a planet could produce prebiotic chemicals from common interstellar building blocks, regardless of the planetary environment.

To read more, go to http://pubs.acs.org/cen/news/88/i13/8813news14.html

Latest *Newsline* available

NEWSLINE

Newsline provides the latest Lab research and operations news. See the most recent issue at https://newsline.llnl.gov

Photo of the week:

Sign here: From left, physicist Joana Diekman, postdoctoral fellow and physicist Kristl Adams and physicist Julie Herberg detect chemical signatures using a portable nuclear magnetic resonance (NMR) spectrometer, developed by the Lab's Center for National Security Applications of Magnetic Resonance. The spectrometer has been shrunk in size from about one-quarter of a room to approximately the size of a briefcase.

LLNL applies and advances science and technology to help ensure national security and global stability. Through multi-disciplinary research and development, with particular expertise in high-energy-density physics, laser science, high-performance computing and science/engineering at the nanometer/subpicosecond scale, LLNL innovations improve security, meet energy and environmental needs and strengthen U.S. economic competitiveness. The Laboratory also partners with other research institutions, universities and industry to bring the full weight of the nation's science and technology community to bear on solving problems of national importance.

To send input to the Livermore Lab Report, send e-mail mailto:labreport@llnl.gov.

The *Livermore Lab Report* archive is available at:
https://publicaffairs.llnl.gov/news/lab_report/2010index.html